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## **ELONGATED ORIFICE CLOSURE**

### **BACKGROUND**

[0001] This invention relates to container closures, and more particularly to hinged container closures having an opening for dispensing material therethrough.

[0002] Several types of closures for sealing a container for holding and dispensing sauces and other contents are known. For example, a removable closure may be coupled to a container by threads disposed on an interior surface of the closure and mating threads disposed on an exterior surface of the container neck. Unscrewing the closure enables complete detachment of the closure from the container and easy dispensing from an opening in the container. The drawbacks of the fully-removable closure include potential loss or soiling of the closure while it is detached, the requirement of two hands to operate the closure, and a generally inconvenient opening process compared with some other closures. Further, in some circumstances, the container contents may adhere to the underside of the closure and eventually coat the threads, which is unattractive, unsanitary, and may inhibit the unscrewing process.

[0003] Another type of closure employs a cap that is hinged to a body such that the cap may be pivoted relative to the body. The body may be coupled to a container by threads disposed on an interior surface of the closure body and mating threads disposed on an exterior surface of the container neck. Some versions of the hinged closure include a deck

covering the container opening except for a circular (in transverse cross section) pour or dispensing opening formed therein. A circular plug formed on the underside of the cap is insertable into a spout that is formed proximate the pour opening upon closing of the cap relative to the body. Unfortunately, during normal operation the plug contacts the container contents that are disposed proximate the pour opening upon closing. Thus, residue of the material contents adhere to the plug and are visible on the plug upon pivoting the cap relative toward its open position, which is unattractive and difficult to clean.

[0004] Containers having a hinged cap often have a liner that is disposed over the container opening to form a seal therewith. Typically, the closure is tightened before the liner is sealed to the container rim by induction welding or like process. Unfortunately, the induction welding process tends to loosen the closure such that, in some circumstances, the torque required to unscrew the closure is below a desired value or near zero -- that is, the closure is loose. Further, the container liquid or semi-solid contents, or water used to wash the threads or container, often adheres to the threads of the container and closure during the filling process. The loose closure enables evaporated liquid from the thread area or from the ambient atmosphere to condense within the closure and collect on top of the liner. Thus, an end user may encounter the condensed liquid upon removing the closure and before piercing or removing the liner, which is undesirable.

## **SUMMARY**

[0005] A closure is provided that includes a spout projecting from a closure body and a sealing spout cover projecting from a hinged cap. The spout cover forms an outside seal with the spout. According to a first aspect of the present invention, a closure for resealably closing a container comprises a closure body, a cap, and a hinge.

[0006] The closure body includes a top deck; a skirt downwardly depending from a periphery of the top deck, the skirt including threads disposed thereon; an elongated orifice formed in the top deck, the elongated orifice defining a length that is greater than its width; and a spout extending upwardly from the top deck substantially coextensive with the orifice. The spout and top deck merging to form a concave radius on an upper side of the top deck.

An underside of the lower deck forms a convex radius proximate the orifice and opposite the concave radius. The spout preferably includes a pair of opposing vertical sidewalls and a pair of opposing curved end walls. The sidewalls may be configured such that they outwardly bulge upon molding, yet are substantially mutually rectilinear and parallel upon cooling after molding. Such a configuration enables or promotes the ability to form a seal with the cap without a spud on the inside of the spout.

[0007] The cap includes a lid member, a cap sidewall extending downwardly from a periphery of the lid member, and a spout cover extending downwardly from the lid member. The spout cover includes a spout cover sealing surface on an interior surface thereof for receiving the spout therein. The spout cover sealing surface and a surface of the cap form a sealing contact therebetween while the cap is in a closed position, thereby forming an outside seal relative to the spout.

[0008] The hinge is coupled between the body and the cap for enabling actuation of the cap relative to the body between an open position in which the spout cover is disengaged with the spout and the closed position in which the spout cover is engaged with the spout. The orifice enables dispensing of container contents therethrough while the cap is in the open position and the spout cover prevents dispensing of the container contents while the cap is in the closed position. Further, the spout cover deflects outwardly relative to the spout while the cap is moved from the open position to the closed position, thereby forming an interference fit between the spout and the spout cover.

[0009] The present invention also encompasses a mold for forming such a closure.

## **BRIEF DESCRIPTION OF THE FIGURES**

[0010] Figure 1 illustrates a cross sectional view of closure according to the present invention disposed in an as-molded position;

[0011] Figure 2 is a top view of the closure shown in Figure 1 ;

[0012] Figure 3 is a cross sectional view taken through a portion of the closure indicated

by lines 3-3 in Figure 2, thereby providing a view of the inboard side of the spout;

[0013] Figure 4 is a cross sectional view taken through a portion of the closure indicated by lines 4-4 in Figure 2, thereby providing a view of the outboard side of the spout;

[0014] Figure 5 is a cross sectional view taken through a portion of the closure indicated by lines 5-5 in Figure 2;

[0015] Figure 6 is a view of the closure of Figure 1 disposed in a fully closed position;

[0016] Figure 7 is an enlarged view of a portion of the closure identified in the circle labeled by reference numeral 7 in Figure 1; and

[0017] Figure 8 is an enlarged view of a portion of the closure identified in the circle labeled by reference numeral 8 in Figure 1.

## **DESCRIPTION OF A PREFERRED EMBODIMENT**

[0018] According to a first aspect of the present invention, a container package 8 includes a closure 10 that is coupled to a container 11. A preferred embodiment of closure 10 is shown in Figures 1 and 6, and container 11 is shown diagrammatically in Figure 6. Container package 8 may be employed for packaging any contents capable of flowing, especially viscous materials such as jellies, sauces, pastes, granular materials, and like substances.

[0019] As shown in relief in Figure 6, container 11 includes a container sidewall 12 having a neck 14 that extends upwardly to a lip 18. Container threads 16 are formed on an exterior surface of neck 14. A liner 19 may be disposed on lip 18 over the opening in neck 14 to seal the contents of container 11. Preferably, liner 19 is of the type that may be induction welded to lip 18, such as a plastic liner with a foil layer. The present invention also encompasses the container package 8 employing any liner material. Further, the container package 8 may employ liners of other designs, and may forego a liner altogether. Container 11 may be formed of any conventional material, including plastic and glass, and the present invention is especially suitable for plastic containers having flexible sidewalls that enable squeezing to urge the contents (not shown) to flow through the closure 10.

[0020] As shown in Figure 1, closure 10 includes a body 20 that is coupled to container 11, a cap 24, and a hinge 28 coupled between body 20 and cap 24. Hinge 28 enables cap 24 to be repeatably pivoted relative to body 20. Body 20 includes a generally cylindrical skirt 30 and a substantially circular top deck 32 that preferably is integrally formed with an upper portion of skirt 30. Skirt 30 preferably includes plural serrations 46 disposed on an exterior surface thereof to enhance gripping of closure 10 by a user, as well as closure threads 48 disposed on an interior surface of skirt 30 that mate to threads 16 of container 11. The terms "interior" and "exterior"; "inward" and "outward"; and "inboard" and "outboard", as used herein, refer to relatively inwardly facing and relatively outwardly facing (relative to a longitudinal centerline of container 11 or other point of reference) directions or orientations, unless the direction or orientation is specified otherwise.

[0021] Deck 32 includes a deck top surface 54 and a deck bottom surface 56. As shown in Figures 1, 3, 4, and 7, an annular recess 52 is formed at a periphery of deck 32 and includes a shoulder portion 53a and a substantially flat seating surface 53b. Preferably, shoulder portion 53a and seating surface 53b are configured such that recess 52 is a notch, in longitudinal cross section. Thus, in longitudinal cross section, seating surface 53b is substantially horizontal and shoulder portion 53a may be substantially vertical to form an approximate cylinder, or may be angled slightly radially inwardly to form an approximate frustum of a cone. The present invention encompasses other configurations of the portion of deck 32 that interfaces with cap 24 in the closed position, as will be apparent to persons familiar with closure configurations.

[0022] An orifice 50 is formed through deck 32 between top surface 54 and bottom surface 56 to enable dispensing of the contents from an interior of container 11. As shown in Figures 2 and 3 (which are aligned for convenience of illustration), orifice 50 has a length L1, which is measured along its longitudinal axis A1, that is greater than its width W1, which is measured transverse to longitudinal axis A1 at the widest point of orifice 50. Orifice 50 is shown in the figures as a slot having, in plan view as shown in Figure 2, a pair of sidewalls with semi-circular or rounded ends. The present invention is not limited to such a configuration, and encompasses an orifice in the shape of an ellipse, oval, and the like. For dispensing jelly, or a similarly viscous product, from a container that is capable of being deformed by squeezing, the L1 and W1 dimensions are preferably about 1.0 inches (25.4

mm) and 0.2 inches (5 mm), respectively. An orifice having such dimensions may dispense the contents through orifice 50 in a ribbon approximately one inch wide.

[0023] A spout 58 extends upwardly from top surface 54 about orifice 50. Preferably, spout 58 has a pair of opposing long sides 60a and a pair of opposing curved ends 60b that extend around the entire perimeter or periphery of orifice 50. Preferably, opposing long sides 60a are substantially parallel or slightly outwardly bowed (relative to orifice longitudinal axis A1), as explained more fully below. The present invention also encompasses long sidewalls that are angled inwardly at the top or bottom of orifice 50 (which configuration is not shown) and therefore encompasses sidewalls that are not mutually parallel, and also encompasses sidewalls that are slightly inwardly bowed in plan view. Other wall configurations are also contemplated.

[0024] Deck top surface 54 smoothly merges into spout sidewall 60a to form a concave radius 57a. Deck bottom surface 56 smoothly extends upwardly to form a convex radius portion 57b, which smoothes the flow of product during dispensing. Preferably, the radii 57a and 57b may be approximately 0.09 and 0.13 inches, respectively, which have been found to provide adequate product flow characteristics. In this regard, because the radius of convex radius 57b on the underside is relatively large, concave radius 57a may have a similar profile to that of convex radius 57b in order to provide adequate wall thickness and efficient use of material.

[0025] As best shown in Figure 7, spout sidewall 60 includes an interior surface 62a, an opposing exterior surface 62b, and a distal rim 62c therebetween. A protrusion or bead 63 extends radially outwardly from exterior surface 62b, and preferably extends entirely around the perimeter of spout sidewall 60 and orifice 50. Spout bead 63 may be formed of any geometry, and preferably is defined, in longitudinal cross section as shown in Figure 7, by an upper surface 64a, an opposing lower surface 64b, and a distal tip 64c disposed between surfaces 64a and 64b.

[0026] Preferably, spout bead surfaces 64a, 64b, and 64c form smooth contours without sharp edges or transitions. In this regard, tip 64c may be (in longitudinal cross section) a rounded portion below a substantially flat, inclined (relative to the sidewalls of surfaces 62a

or 62b) upper surface 64a such that rounded tip portion 64c smoothly yields to upper surface 64a. Further, lower surface 64b preferably is short compared to upper surface 64a such that tip 64c smoothly merges with the sidewall of exterior surface 62b. The present invention is not limited to the contours described herein, but rather encompasses any spout bead contours or any sealing means, even a spout that altogether lacks protrusions or beads like those described herein, as will be understood by persons familiar with closure and sealing technology. For example, surfaces 64a, 64b, and 64c may define a continuously curved or bulbous protrusion or bead. The present invention also encompasses a spout that lacks a protruding bead, as well as a discontinuous bead.

[0027] As shown in Figures 1 and 2, cap 24 includes a substantially cylindrical sidewall 36 and a substantially circular lid member 38 that is integrally formed with an upper end of sidewall 36. Lid member 38 has an underside 39 and an opposing top side 41. The terms "underside" and "top", as used herein with respect to cap 24, refer to the orientation with cap 24 in its closed position shown in Figure 6. Cap 24 is inverted from its position shown in Figures 1 and 2 to form its closed position. In this regard, a spout cover 40 extends upwardly from an underside of lid member 38. The present invention also encompasses closures that are non-cylindrical, including those having elliptical, irregular, or other shapes.

[0028] As best shown in Figure 8, spout cover 40 is formed by a cover sidewall 70 having an interior surface 72a, and an opposing exterior surface 72b. Cover sidewall 70 also has an outwardly protruding lip 71 disposed between surfaces 72a and 72b. A cover protrusion or bead 73 extends radially inwardly, relative to spout cover 40, from interior surface 72a, and preferably extends entirely around the perimeter of spout cover sidewall 70. Spout cover 40 preferably is configured to fit over and outside of spout 58, as described more fully below. Thus, spout cover 40 may have an internal length dimension L2 along its longitudinal axis A2 that is approximately equal to orifice length L1 plus twice the width of spout sidewall 60, and an internal width dimension W2 that is approximately equal to orifice width W1 plus twice the thickness of spout sidewall 60.

[0029] Spout bead 73 may be formed of any geometry, and preferably is defined, in cross section, by an upper surface 74a, an opposing lower surface 74b, and a distal tip 74c disposed between surfaces 74a and 74b. In this regard, tip 74c may be, in longitudinal cross section as



shown in Figure 8, a rounded portion below a substantially flat, inclined (relative to the sidewalls of surfaces 72a or 72b) upper surface 74a such that rounded tip portion 74c smoothly yields to upper surface 74a, and such that upper surface 74a forms a portion of distal lip 71. The present invention is not limited to the contours described herein, but rather encompasses any spout cover bead contours or any sealing means, a discontinuous bead, and even a spout cover that altogether lacks beads like those described herein, as will be understood by persons familiar with closure and sealing technology. For example, surfaces 74a, 74b, and 74c may define a continuously curved or bulbous protrusion or bead.

[0030] Hinge 28 includes a first end 76a that is integrally coupled with skirt 30 and an opposing second end 76b that is integrally coupled with cap 24. Preferably, hinge 28 is a flexible web that forms a snap hinge, as disclosed in United States Patent Number 6,152,320, which is assigned to the assignee of the present invention and incorporated herein by reference in its entirety. The present invention is not limited to snap hinges, but rather encompasses any hinge disposed between cap 24 and body 20.

[0031] Figure 6 illustrates the closure 10 in a closed position in which cap 24 is engaged with body 20. In the closed position, a portion of cap sidewall 36 is disposed in the recess 52 formed by shoulder portion 53a and seating surface 53b. Preferably, the internal radius of the cap sidewall 36 is several thousandths of an inch larger than the radius of shoulder portion 53a to enable cap 24 to slide into and out of recess 52. Preferably, a distal rim or tip of cap sidewall 36 contacts seating surface 53b in the fully closed position.

[0032] Further, spout cover 40 is disposed over and around spout 58 to form a seal therewith while cap 24 is in its fully closed position. As explained more fully below, because long sidewalls are (in plan view or in transverse cross section) substantially parallel (even after shrinking upon cooling after molding) or slightly outwardly bowed, spout cover 40 forms a seal with spout 58. For example, a seal may be provided by sealing contact between sealing surfaces 62b and 72a, which is described more fully below. Preferably, each one of spout 58 and spout cover 40 are continuous and coextensive. That is, the overall shape (in transverse cross section) and size of spout sidewall exterior surface 62b are substantially the same as the shape and size of cover sidewall interior surface 72a. Thus, spout 58 fits within spout cover 40 and forms sealing contact therebetween.

[0033] As shown in Figure 6, while cap 24 is in the fully closed position, spout cover 40 is engaged with spout 58 to form the sealing contact therebetween such that cover bead 73, and particularly cover bead tip 74c, contacts spout sidewall exterior surface 62b and such that spout bead 63, and particularly spout bead tip 64c contacts cover sidewall interior surface 72a. In this regard, spout 58 and spout cover 40 are preferably molded such that there is contact between tip 74c and surface 62b and between tip 64c and surface 72a such that deflection of spout 58 and/or spout cover 40 occurs during closing and, preferably, also while closure 10 is in the fully closed position. Figure 6 indicates such deflection by illustrating body 20 and cap 24 in their fully open shape, which results in overlapping surfaces at the interface between spout 58 and spout cover 40.

[0034] Closure 10 may be configured to require a predetermined opening force, which preferably is in the range of 1 to 7 pounds (0.45 to 3.2 kg), depending on the design parameters and preferences of the designer. The opening force may be determined by the configuration, dimensions, and/or location of beads 63 and 73, sidewalls 60 and 70, orifice 50, and like features, as will be understood by persons familiar with closure technology. Thus, the sealing contact between spout 58 and spout cover 40 (among other features) provides the combination of an effective seal around orifice 50 and an opening force within the desired range.

[0035] Hinge 28, while the closure is in the fully closed position, may provide a small force urging cap 24 toward the open position to bias cover bead lower surface 74b toward and against spout bead lower surface 64b. The contacts between tip 74c and surface 62b and between tip 64c and surface 72a, and preferably also bead surfaces 64b and 74b, preferably are continuous around the entire periphery of spout 58. However, the present invention encompasses discontinuous sealing contact.

[0036] Thus, according to an aspect of the present invention, the sealing contact between spout 58 and spout cover 40 forms an outside seal (that is, disposed on the exterior surface of the spout sidewall 60) that is spaced apart from the rim 62c of spout 58. In this regard, during normal dispensing of the material contents from container 11 through orifice 50, the material contents do not come into contact with the sealing contact area that is defined between the spout exterior surface 62b and the spout cover sidewall 72b. Therefore, during

normal dispensing of the contents from the container package, the sealing contact between the spout 58 and the spout cover 40 is spaced apart from the contents and does not become sullied thereby.

[0037] Further, lip 71 may also aid in the centering of cap 24 relative to spout 58 during the closing process. The outwardly extending configuration of lip 71 may also wipe product from the area proximate spout rim 62c without exposing spout cover outer sidewall 72b to the product.

[0038] According to another aspect of the present invention, as shown in Figures 3 and 5, an annular closure seal 80 is formed on an underside of deck 32 such that a body 82 of seal 80 protrudes downwardly from deck bottom surface 56. As best shown in Figure 5, closure seal 80 includes a flexible lip or crab claw, which preferably is continuous to form an unbroken circle in transverse cross section. Seal 80 may prevent liquid in the thread area from splashing onto the top surface of liner 19 or from running onto the top surface of liner 19 upon inversion of container package 8 or upon washing.

[0039] Further seal 80 may prevent or inhibit water vapor from entering the head-space, which is above the liner 19 and below deck 32, and condensing therein. Also, the sealing contact between spout 58 and spout cover 40 also inhibits water vapor from entering the head-space. Thus, seal 80 and the sealing contact between spout 58 and spout cover 40 substantially eliminate or diminish the problem of water condensation on the top of liner 19.

[0040] To open container package 8, a user may grasp container neck 14 with cap 24 in the closed position, as shown in Figure 6, in which tip 74c and surface 62b, and tip 64c and surface 72a are in contact. The user may urge upwardly on a thumbpiece (preferably disposed opposite hinge 28) of cap 24 to urge cover bead lower surface 74b against spout bead lower surface 64b. Each of the surfaces 64b and 74b are rounded or inclined to facilitate mutual sliding in response to upward urging of a thumb tab (not shown in the Figures) or like portion of cap 24 until cover bead tip 74c slips upward past spout bead tip 64c. Cap 24 continues to rotate relative to body 20 by continued urging of cap 24 and/or by the action of snap hinge 28 until it reaches its rest-open position, which is likely to be less than 180 degrees from its fully closed position, depending to the configuration of hinge 28.

The position of cap 24 relative to body 20 shown in Figures 1 and 2 is the position in which closure 10 is molded, and may not represent the rest-open position of cap 24.

[0041] Upon cap 24 being disposed in its rest-open position, the user may invert container package 8 to dispense the material contents through orifice 50. For containers with flexible sidewalls, the user may squeeze the container sidewalls to urge the material contents through orifice 50. The elongated shape of orifice 50 provides greater open area through which material contents may pass.

[0042] The user may urge cap 24 toward deck 32 to pivot closure 10 from its open position toward its closed position. Hinge 28 may also urge cap 24 toward its closed position upon reaching its snap action point. The orifice being spaced apart from a center of deck 32, as best shown in Figure 2, enables spout cover 40 to clear spout 58 during pivoting about hinge 28. Alternatively, a hinge may be provided that enables spout cover 40 to clear spout 58, and the respective heights and location of cover 40 and spout 58 may be chosen accordingly. To move cap 24 into its fully closed position, the user may urge cap 24 downwardly such that the distal rim of cap sidewall 36 moves past the rounded portion of shoulder portion 53a. Further, spout cover lip 71 (which is the leading surface of spout cover 40 because cap 24 is in an inverted from its molded state during closing) may contact spout bead upper surface 64a to relatively align the parts and/or to wipe product contents (if any) from the top area of spout 58 inwardly toward orifice 50.

[0043] A user applies force downwardly on cap 24 such that cover bead upper surface 74a slides relative to spout bead upper surface 64a. Spout cover sidewall 70 and/or spout sidewall 60 deform or deflect relative to one another until cover bead tip 74c is urged downwardly past spout bead tip 64c. As cover bead lower surface 64b comes into contact with spout bead lower surface 74b such that cap 24 reaches its fully closed position, a distal rim of cap sidewall 36 may contact seating surface 53b.

[0044] According to another aspect of the present invention, a mold 90 has a cavity with surfaces configured for forming closure 10. Mold 90 is indicated diagrammatically in Figure 1 by a dashed line. The precise gate location, split line, and other parameters relating to molding are conventional and will be understood by persons familiar with molding

technology. The present invention encompasses molding of closure 10 in mold 90 by any conventional technique, such as injection molding, compression molding, and the like.

[0045] As referred to above, sidewalls 60a spout 40 will have a tendency to pull inwardly when its material cools and shrinks after molding. Thus, mold 90 includes cavity surfaces that are slightly outwardly bowed. Thus, because spout 58 (that is the mold surface corresponding to spout 58, as well as the spout 58 of closure 10 immediately upon molding) has a width W1 proximate its midpoint that is greater than a width proximate its ends, cooling or shrinkage may result in substantially parallel spout sidewalls 60a. Depending on the particular configuration, size, wall thickness (and like parameters), spout 58 preferably may be a few thousandths of an inch wider at its center (that is, W1) than at its ends. Similarly, the mold cavity surfaces may be configured such that sidewalls 60a have a slight bow after cooling and shrinkage in order to enhance the contact between spout 58 and spout cover 40.

[0046] Embodiments of the closure, mold, and container assembly disclosed herein have been employed to illustrate aspects of the present invention. The scope of the present invention, however, is not limited to the particular embodiments discussed herein, but rather encompasses other embodiments that will be apparent to persons familiar with closure technology in view of the present disclosure. For example, the present invention encompasses closures that are coupled to the container integrally or by a snap feature, as distinguished from the threads shown in the figures, closures that are oval or otherwise non-circular in transverse cross section, closures having hinges that are different from that described herein, or those entirely foregoing hinges, and the like. Further, co-pending United States Patent Application Number 09/780,760, entitled, "Elongated Closure Orifice," which is incorporated herein by reference in its entirety, provides additional details of components that may be employed with the present invention. Thus, the scope of the invention may be ascertained by reference to the claims.